Data Usability Evaluation For Risk Assessment

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Data Usability

- **Process of determining that quality of the data is adequate for intended use**
- **Identifies level of certainty in analytical data (HRA uncertainties)**
- **Consistent, scientifically-based, framework for risk assessors (USEPA, 1992)**

Health Risk Assessment

- **Chemicals of Potential Concern**

  Sources, mixtures, degradation products

- **Toxicity Assessment**

  Type of health effect, dose-response

- **Exposure Assessment**

  Exposure concentration, exposure factors

- **Risk Characterization**

  Incremental lifetime cancer risk, hazard index

General Risk Equation

Incremental Cancer Risk = Site Dose (mg/kg-day) x Cancer Slope Factor ($(mg/kg\text{-}day)^{-1}$)

Noncancer Hazard = Site Dose (mg/kg-day) / Acceptable Dose (mg/kg-day)

General Dose Equation

$$\text{Dose (mg/kg-day)} = \frac{C \times IR \times EF \times ED \times Bio}{BW \times AT}$$

Where:

Dose	=	Daily dose (ADD, LADD)
C	=	Chemical concentration in environmental medium
IR	=	Intake rate
EF	=	Exposure frequency
ED	=	Exposure duration
Bio	=	Bioavailability
BW	=	Body weight
AT	=	Averaging time

USEPA Data Usability Evaluation Criteria

I. SITE CHARACTERIZATION REPORTS
- Report component checklist

II. SAMPLE DOCUMENTATION
- Each result must be related to specific geographic location
- Documentation via COC, SOP, filed/analytical record

III. DATA SOURCES
- Analytical methods adequate to identify COPCs
- Sources, exposure areas
- Broad spectrum analyses

USEPA Data Usability Evaluation Criteria (cont.)

IV. ANALYTICAL METHODS AND DETECTION LIMITS

- **Routine (e.g., USEPA, ASTM) methods**
- **Detection limits < risk benchmark concentration**

V. DATA REVIEW

- **Overall examination of laboratory and method performance**
- **Defined level of review for all data**

VI. DATA QUALITY INDICATORS

- **Completeness**
- **Comparability**
- **Representativeness**
- **Precision**
- **Accuracy**

J&E Model

- One-dimensional, upward vapor transport from subsurface into residence/building ("Indoor air EPC")
- Diffusion
- Advection
- No degradation
- Steady-state ("the vapors have arrived")
- User-defined "soil" and "building" parameters

Soil Parameters

Parameter	Symbol	Minimum	Default	Maximum
Soil Conc.	C_s	**800 ug/kg**	**1000 ug/kg**	**1200 ug/kg**
Moisture content	q_w	**0.061 cm^3/cm^3**	**0.148 cm^3/cm^3**	**0.239 cm^3/cm^3**
Fraction organic carbon	f_{oc}	**0.001 g/g**	**0.002 g/g**	**0.006 g/g**

Building Parameters

Parameter	Symbol	Minimum	Default	Maximum
Differential pressure	**DP**	**0.04 Pa**	**4 Pa**	**20 Pa**
Exchange rate	**ER**	**0.24 hr^{-1}**	**0.25 hr^{-1}**	**1.13 hr^{-1}**

Model Scenarios

Scenario	C_s	q_w	f_{oc}	DP	ER
"Minimum"	**Min. (800 ug/kg)**	**Max. (0.239 cm^3/cm^3)**	**Max. (0.006 g/g)**	**Min. (0.04 Pa)**	**Max. (1.13 hr^{-1})**
"Default"	**Default (1000 ug/kg)**	**Default (0.148 cm^3/cm^3)**	**Default (0.002 g/g)**	**Default (4 Pa)**	**Default (0.25 hr^{-1})**
"Maximum"	**Max. (1200 ug/kg)**	**Min. (0.061 cm^3/cm^3)**	**Min. (0.001 g/g)**	**Max. (20 Pa)**	**Min. (0.24 hr^{-1})**

Model Results

Scenario	C_{air} (ug/m^3)
“Minimum”	**0.13**
“Default”	**55**
“Maximum”	**130**

Monte Carlo Runs

- Develop probability distributions based on the ranges of the input parameters
- Use these probability distributions as input to the J&E model

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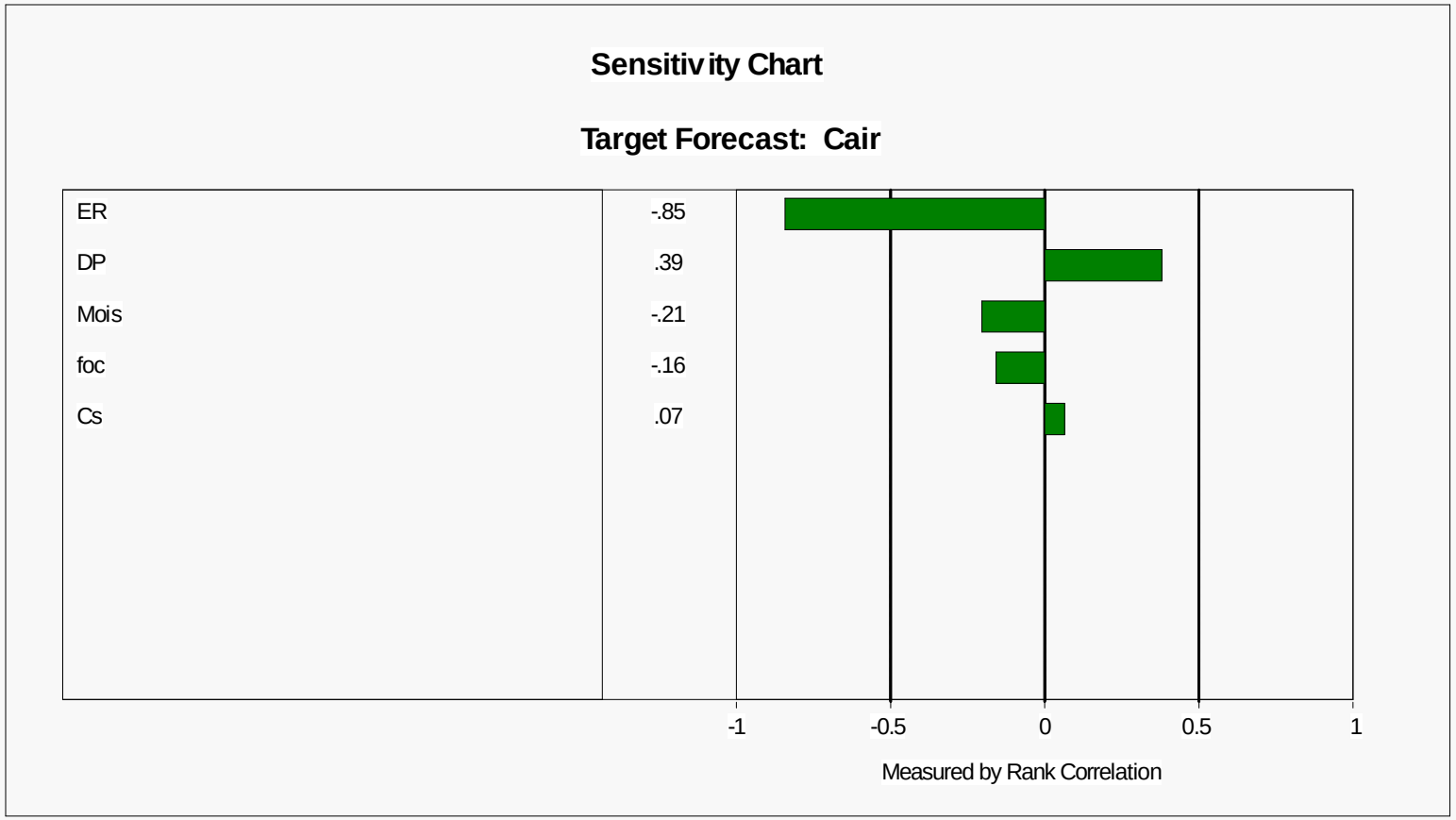
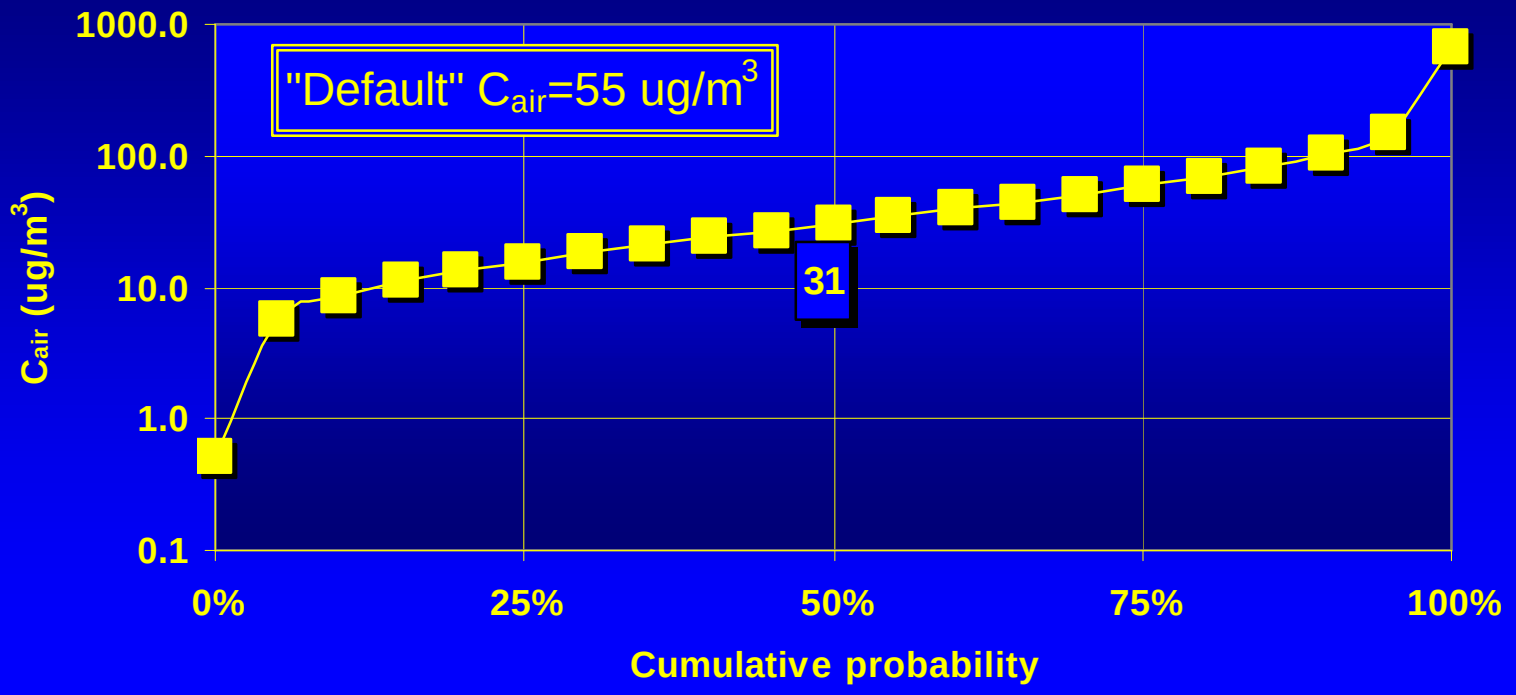
- Identify the most sensitive parameters for the user-defined ranges
- Generate a probability distribution of C_{air}

Sensitivity Chart



Cumulative Probability Distribution of C_{air}



Closing Comments

Data Usability:

- Is conducted as a consistent, EPA-defined six-step process
- Involves data review by those experienced in site characterization, toxicology, and laboratory analytical methods
- Results in the dataset used to establish exposure point concentrations (e.g., via modeling, statistical calculations), which are used to calculate doses and risks
- Facilitates risk-based closure
- Reduces closure costs